Paint by Numbers
(Nonogram)
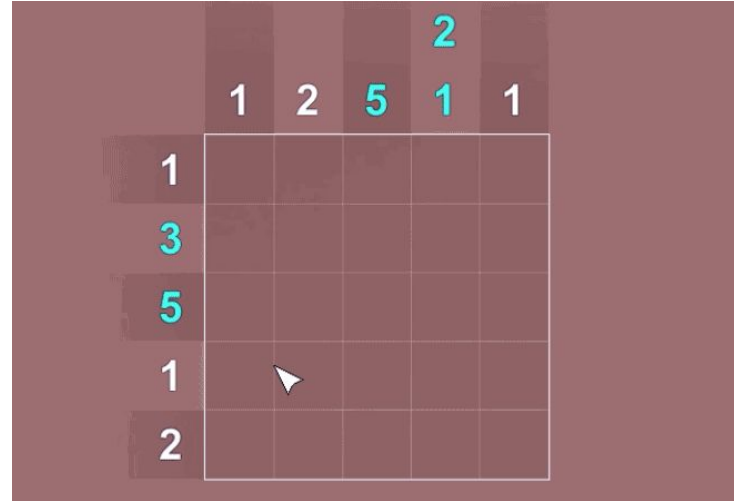
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CS 142

What is a nonogram?

Nonogram

- other names: **Hanjie**, **Paint by Numbers, Picross**, **Griddlers**, **Pic-a-Pix**
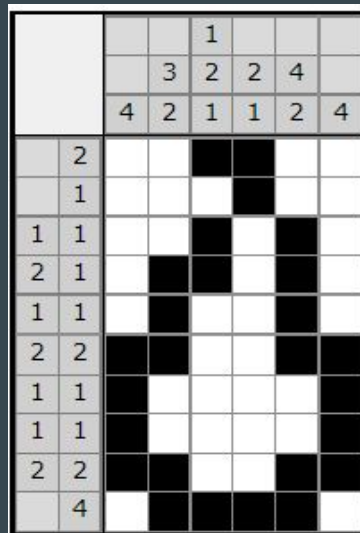- an encrypted image is revealed by coloring blocks/cells of a grid based on the numbers hinted at the sides.

Source: https://www.alphabetagamer.com/pictopix-beta-demo/

Nonogram

- Hint numbers → number of boxes that needs to be colored
- **Order** of the numbers indicate the order of the groups of colored blocks
- **B&W**: Must have at least **one space** in between sets
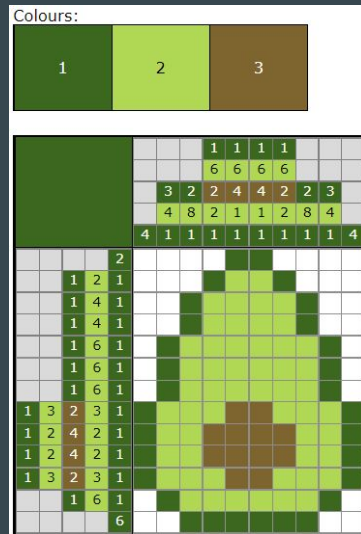- Colored: same as B&W; sometimes no spaces for adjacent different colors

B&W

Source: https://www.nonograms.org/nonograms/i/50550

COLORED

Source: https://www.nonograms.org/nonograms2/i/50864

Why is a nonogram an NP-complete problem?

Nonogram as an NP-complete problem

- Each nonogram displays a unique encrypted image.
- There is no "good" solution for all nonogram puzzles.

How to solve?

Possible Solutions

- Depth-First Search (backtracking)
  - Visualization: https://lihautan.com/solving-nonogram-with-code/7bfbcf67e3276087.gif

Possible Solutions

- Priority Queue & Breadth-First Search (contradiction)

Source: https://www.alphabetagamer.com/pictopix-beta-demo/
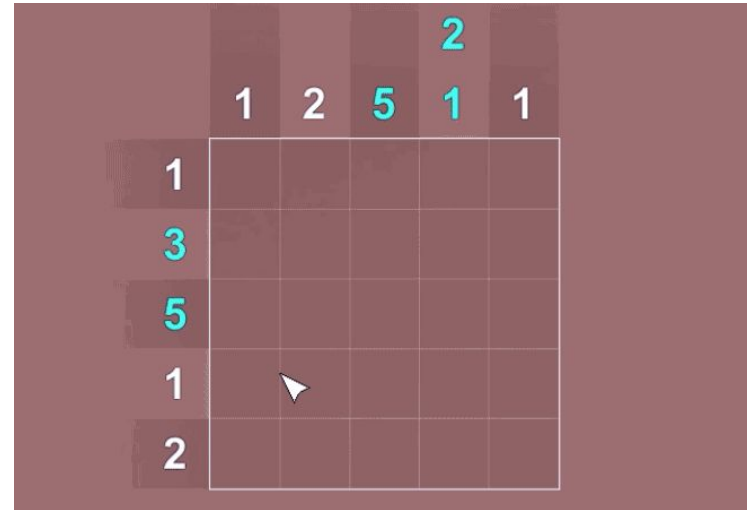
Let's try solving one!

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